

Digital Financial Inclusion and Poverty Reduction: A Longitudinal Analysis of the Mediating Effect of Financial Literacy

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Abstract

The study investigated the impact of digital financial inclusion (DFI) on poverty reduction in Nigeria, disaggregating DFI into three distinct dimensions: penetration, availability, and usage. The study adopts a quantitative, longitudinal research design utilising annual time-series secondary data from 2008 to 2024 (17 years), sourced from the Central Bank of Nigeria Statistical Bulletin, National Bureau of Statistics, and Nigeria Inter-Bank Settlement System. Three separate Ordinary Least Squares (OLS) regression models were estimated, with financial literacy serving as a mediating variable. Findings revealed that financial penetration has a negative and statistically significant effect on poverty ($\alpha = -0.0342$, $p = 0.033$), financial availability has a negative but statistically non-significant effect at the 5% level ($\gamma = -2.891$, $p = 0.079$), and financial usage has a negative and statistically significant effect on poverty ($\delta = -2.145$, $p = 0.048$). Among the three models, financial usage demonstrated the highest explanatory power ($R\text{-squared} = 0.61$). The study concludes that while all three dimensions of financial inclusion contribute to poverty reduction in Nigeria, active usage of digital financial services exerts the largest impact. It recommends that the Central Bank of Nigeria should prioritise mobile money adoption by reducing transaction costs and expanding agent networks to close the poverty gap effectively.

Keywords: Digital Financial Inclusion, Poverty Gap, Fintech, Nigeria, Longitudinal Analysis, Mobile Money.

Introduction

Poverty remains one of the most persistent developmental challenges confronting sub-Saharan Africa, with Nigeria unfortunately occupying the unenviable position of being the poverty capital of the world. According to the World Bank (2022), an estimated 104 million Nigerians live below the national poverty line, representing over 40 per cent of the population. This paradox is particularly striking given that Nigeria is Africa's largest economy, endowed with vast human and natural resources, including the largest crude oil reserves on the continent (Oxford Economics, 2023). The persistence of widespread poverty despite significant macroeconomic growth has compelled policymakers, development economists, and international financial institutions to search for innovative, scalable, and sustainable poverty reduction strategies that go beyond traditional welfare interventions.

Historically, poverty reduction strategies in Nigeria have relied heavily on agricultural subsidies, public works programmes, conditional cash transfers, and microcredit schemes administered through formal banking institutions (National Social Safety Nets Coordinating Office, 2021). While these interventions achieved modest successes, their reach remained constrained by the structural realities of Nigeria's financial landscape. For decades, a substantial proportion of the Nigerian population particularly, rural dwellers, women, and youth remained completely excluded from the formal financial system. The Central Bank of Nigeria (CBN, 2018) reported that as late as 2010, over 46 per cent of Nigerian adults were financially excluded, lacking access to any form of formal bank account, credit, or insurance. The primary barriers to financial inclusion included physical distance to bank branches, prohibitive minimum deposit requirements, lack of acceptable identification documents, and low levels of formal literacy (EFInA, 2020).

The advent of digital financial services, beginning with mobile money pilots in the late 2000s and accelerating dramatically after 2015, fundamentally altered this exclusionary landscape. Digital financial inclusion (DFI) refers to the deployment of digital technologies—mobile phones, point-of-sale devices, agent networks, and online platforms—to deliver financial services to previously unbanked or underbanked populations (GSMA, 2020). Unlike traditional banking, digital finance lowers transaction costs, eliminates geographical barriers, and enables real-time, small-value transactions that are particularly suited to poor households' cash flow patterns (Jack & Suri, 2011). In Nigeria, the CBN's National Financial Inclusion Strategy (revised in 2018) explicitly targeted digital channels as the primary mechanism for reducing the financial exclusion rate to 20 per cent by 2024 (CBN, 2018).

The theoretical link between financial inclusion and poverty reduction is well established in development economics. The classical view, articulated most prominently by Beck, Demirgüç-Kunt, and Levine (2007), posits that financial inclusion enables poor households to smooth consumption, build assets, invest in education and health, and manage risks more effectively. However, recent scholarship has refined this broad proposition by disaggregating financial inclusion into distinct dimensions—penetration (account ownership), availability (density of access points), and usage (frequency and volume of transactions)—arguing that each dimension may have differential effects on poverty (Koomson, Villano, & Hadley, 2020). This disaggregation is critical because a household may own a mobile money account (penetration) and live near an

agent (availability) but rarely transact digitally (usage), thereby deriving few poverty-reducing benefits.

In Nigeria, the digital financial inclusion landscape has evolved rapidly but unevenly. Mobile network operators, fintech start-ups (e.g., Paga, Opay, Moniepoint), and commercial banks have aggressively rolled out agent banking networks, driving penetration rates from 32 per cent in 2012 to over 58 per cent by 2023 (NIBSS, 2024). Digital transaction volumes grew from less than 50 million annually in 2015 to over 3.5 billion by 2023, with a corresponding value exceeding ₦200 trillion (NIBSS, 2024). Nevertheless, significant disparities persist. Northern Nigeria, which also records the highest poverty rates, continues to exhibit low digital adoption due to infrastructure deficits, lower mobile phone ownership, and cultural barriers (EFInA, 2022). Moreover, financial literacy remains low nationally, with only 42 per cent of Nigerian adults classified as financially literate (Klapper, Lusardi, & Van Oudheusden, 2015). This low literacy potentially constrains the poverty-reducing impact of even high DFI penetration and usage.

Despite the policy enthusiasm for digital financial inclusion as a poverty reduction tool, empirical evidence specific to Nigeria remains surprisingly limited. Most existing studies have examined financial inclusion in aggregate, without distinguishing between penetration, availability, and usage (Okonkwo & Odularu, 2020). Others have focused on a single digital service, such as mobile money, without comparing across DFI dimensions (Okafor, Eze, & Udeh, 2021). Furthermore, few studies have explicitly incorporated financial literacy as a mediating variable, despite theoretical reasons to expect that literacy enhances the poverty-reducing effects of digital finance (Grohmann, Klühs, & Menkhoff, 2018). The temporal scope of existing research is also constrained, with most analyses ending around 2019, thereby missing the rapid acceleration of digital finance during and after the COVID-19 pandemic (Apedo, 2021).

It is against this background that the present study investigates the impact of digital financial inclusion on poverty reduction in Nigeria, disaggregating DFI into its three constituent dimensions—penetration, availability, and usage—while positioning financial literacy as a mediating variable. By utilising annual time-series data from 2008 to 2024 (17 years), the study captures the pre-digital era, the take-off phase of mobile money, and the mature digital finance landscape. The study is guided by the recognition that not all forms of digital financial inclusion are equally effective in reducing poverty and that policy interventions must be tailored to the specific dimension that yields the greatest marginal impact. In doing so, the research contributes

to both academic knowledge and evidence-based policymaking in Nigeria's quest to achieve Sustainable Development Goal 1 (No Poverty) by 2030.

Theoretical and literature review

The theory of financial inclusion and poverty traps, drawing on the work of Banerjee and Duflo (2011) and Karlan and Morduch (2010), integrates insights from behavioural economics and development microeconomics to explain how lack of access to formal finance can perpetuate poverty traps. A poverty trap exists when a household's income is so low and volatile that it cannot save or invest enough to escape poverty, leading to a self-reinforcing cycle of deprivation. In Nigeria, where a large proportion of the population lives near the poverty line and faces frequent income shocks (e.g., inflation spikes, fuel price increases, conflict), this theory argues that financial inclusion could serve as a critical buffer against poverty traps (Karlan & Morduch, 2010). However, the theory also recognizes that poorly designed financial products—with high fees, inflexible repayment schedules, or aggressive collection practices—may exacerbate vulnerability rather than reduce it. Hence, it relevance to this study.

On the empirical front, there are several documented studies on the impact of financial inclusion on poverty in Nigeria. However, studies that focus on each of the three digital financial inclusion dimensions and their effect on poverty reduction are scanty. For instance, Honohan (2008) used cross-country data for over 160 countries and found that a 10% increase in the share of households with a bank account was associated with a 2.5% reduction in the poverty headcount ratio, even after controlling for GDP per capita. Similarly, Swamy (2014), analyzing Indian district-level data, reported that higher account penetration significantly reduced rural poverty, primarily through increased savings and access to government transfers.

In sub-Saharan Africa, Allen et al. (2016) used Findex data for 27 African countries and found that account ownership (penetration) was positively associated with lower poverty vulnerability, but the effect was conditional on literacy and proximity to financial access points. Beck, Demirgüç-Kunt, and Levine (2007) conducted a landmark study using bank branch density across 99 countries. They found that higher branch density was associated with lower income inequality and a smaller poverty gap, especially in low-income countries. The mechanism was increased small business lending. Burgess and Pande (2005), using Indian state-level data, found that a one-standard-deviation increase in rural bank branches reduced rural poverty by 1.3 percentage points annually. Kpodar and Andrianaivo (2011) analyzed 44 African countries from

1990 to 2007 and found that branch expansion had a stronger poverty-reducing effect in rural than urban areas. However, they noted diminishing returns: beyond 15 branches per 100,000 adults, additional branches had minimal impact due to low population density.

In Tanzania, Mbiti and Weil (2015) found that mobile money usage reduced the incidence of self-reported poverty by 12%, but the effect was contingent on having at least one household member with secondary education. In Uganda, Blumenstock et al. (2015) used call detail records and found that mobile money transactions reduced the impact of rainfall shocks on consumption (i.e., resilience effect), thus preventing transient poverty from becoming chronic. In Ghana, Abor and Biekpe (2009) reported that bank branch availability reduced extreme poverty but had no effect on moderate poverty, suggesting a threshold effect. In Kenya, Dupas and Robinson (2013) conducted a field experiment offering free savings accounts to market vendors; they found that women with accounts increased daily savings by 40% and reduced poverty-related stress, but the poverty reduction effect (measured by food security) took over 12 months to materialize.

In Nigeria, specifically, Akinlo and Egbetunde (2019) used time-series data from 1990 to 2017 and found a long-run cointegrating relationship between bank account penetration (proxied by deposit accounts per adult) and poverty reduction (household expenditure). However, the magnitude was small: a 1% increase in penetration led to only a 0.12% decline in poverty. They attributed this to dormant accounts (i.e., low usage). Similarly, Okafor et al. (2020), using cross-sectional data from the Nigerian Living Standards Survey, found that account ownership reduced the probability of being poor by 7%, but the effect was concentrated among the urban educated, suggesting that penetration alone is insufficient without financial literacy. Egbetunde and Fasanya (2018) used state-level panel data (2008–2016) and found that a one-unit increase in bank branches per 100,000 adults reduced the state poverty rate by 0.35 percentage points. However, the effect was highly heterogeneous: states in the South-West (e.g., Lagos, Ogun) saw double the impact of states in the North-East (Borno, Yobe) due to insurgency and low infrastructure.

Ozili (2020), using quarterly data from 2015 to 2019, found that a 1% increase in mobile money transaction volume as a percentage of GDP was associated with a 0.08% reduction in the poverty headcount ratio. However, the effect was not statistically significant in the short run, suggesting a lag. Umaru and Zubairu (2021) argued that branch availability in rural Nigeria often fails to reduce poverty because most branches are non-functional (lack of cash, limited hours) or focus solely on deposits rather than credit. Okonkwo and Odularu (2021) used ARDL bounds

testing and found that in the long run, financial usage was the only significant poverty-reducing variable, while penetration and availability were insignificant unless interacted with digital literacy. This suggests a substitution effect: branches are becoming less relevant as digital channels expand.

A more recent study by Adegbite and Machethe (2022) surveyed 1,200 rural households in Kwara and Oyo states and found that active mobile money users (making at least 10 transactions per month) had 30% higher food expenditure and 22% higher non-food expenditure compared to non-users. However, they noted barriers: network downtime, agent illiquidity, and high transaction fees that disproportionately affect the poorest. Few studies have simultaneously examined penetration, availability, and usage. A notable exception is Churchill and Marisetty (2020), who used global Findex data for 123 countries and found that usage (active transactions) had a larger poverty-reducing effect than mere penetration or branch density.

Methodology

The study adopts a longitudinal (time-series) research design. This design is appropriate as it utilises secondary macro-level time-series data to establish the nature, direction, and magnitude of the relationship between the three dimensions of digital financial inclusion (penetration, availability, and usage) and poverty reduction in Nigeria over the period 2008 to 2024 (17 years). This period is chosen to capture the pre-National Financial Inclusion Strategy (NFIS) era (2008-2011), the NFIS implementation period (2012-2020), and the post-NFIS digital acceleration period (2021-2023). The data were sourced from the CBN, NBS and NIBSS bulletins.

Three separate Ordinary Least Squares (OLS) regression models are specified to address each of the three specific objectives.

Model 1: Financial Penetration and Poverty (Objective i)

$$POV_t = \alpha_0 + \alpha_1 ACC_t + \alpha_2 FINCL_t + \varepsilon_t \dots \dots \dots i$$

Where:

- POV_t = Poverty headcount ratio at time t
- ACC_t = Number of bank accounts per 1,000 adults at time t
- $FINCL_t$ = Financial literacy at time t
- α_0 = Constant term
- α_1 = Coefficient for financial penetration
- α_2 = Coefficient for GDP per capita
- ε_t = Error term at time t

Expected Sign: $\alpha_1 < 0$ (Higher account penetration is associated with lower poverty)

Model 2: Financial Availability and Poverty (Objective ii)

$$POV_t = \gamma_0 + \gamma_1 \text{BRANCH}_t + \gamma_2 \text{FINCL}_t + \varepsilon_t \dots \dots \dots \text{ii}$$

Where:

- POV_t = Poverty headcount ratio at time t
- BRANCH_t = Number of bank branches per 100,000 adults at time t
- FINCL_t = Financial literacy at time t
- γ_0 = Constant term
- γ_1 = Coefficient for financial availability
- γ_2 = Coefficient for GDP per capita
- ε_t = Error term at time t

Expected Sign: $\gamma_1 < 0$ (Higher branch density is associated with lower poverty)

Model 3: Financial Usage and Poverty (Objective iii)

$$POV_t = \delta_0 + \delta_1 \text{MM}_t + \delta_2 \text{FINCL}_t + \varepsilon_t \dots \dots \dots \text{iii}$$

Where:

- POV_t = Poverty headcount ratio at time t
- MM_t = Mobile money transaction volume as a percentage of GDP at time t
- FINCL_t = Financial literacy at time t
- δ_0 = Constant term
- δ_1 = Coefficient for financial usage
- δ_2 = Coefficient for GDP per capita
- ε_t = Error term at time t

Expected Sign: $\delta_1 < 0$ (Higher mobile money usage is associated with lower poverty)

The study employs Ordinary Least Squares (OLS) regression to estimate the three models. OLS is appropriate because it provides the Best Linear Unbiased Estimators (BLUE) when the classical linear regression assumptions are satisfied.

Analysis and Discussion

Descriptive statistics

The descriptive statistics provide a summary of the central tendency, dispersion, and distributional characteristics of the dependent variable (POV), independent variables (ACC, BRANCH, MM), and control variable (GDPPC). The statistics presented include the mean, median, maximum, minimum, and standard deviation for normality.

Table 1
Summary of descriptive statistics (2008–2024)

Statistic	POV (%)	ACC	BRANCH	MM	FINLC
Mean	52.6	452.3	4.82	2.14	2,845
Median	53.1	438.0	4.65	1.85	2,712
Maximum	62.8	687.0	6.42	6.87	3,288
Minimum	40.1	231.0	3.21	0.00	2,145
Std. Dev.	7.3	142.7	0.98	2.13	372
Obs	17	17	17	17	17

Source: E-view 12 statistical software

Based on the table above, the average poverty headcount ratio over the period is 52.6%, indicating that more than half of Nigerians lived below the national poverty line. Account penetration (ACC) increased from 231 accounts per 1,000 adults in 2008 to 687 in 2023, representing a nearly threefold increase. Branch density (BRANCH) grew more modestly from 3.21 to 6.42 branches per 100,000 adults. Mobile money volume (MM) was negligible until 2013 but grew rapidly thereafter, reaching 6.87% of GDP by 2023. GDP per capita peaked in 2014 at \$3,288 before declining due to oil price shocks and the COVID-19 pandemic.

Regression results

Three model for the data estimation techniques were employed based on each specific objective. The results of each model were presented and discussed as follows.

Model 1: Financial penetration (ACC) and poverty

Based on the regression result in table 2. the coefficient on ACC ($\alpha_1 = -0.0342$, $p = 0.033$) is negative and statistically significant at the 5% level. This indicates that financial penetration (measured by number of bank accounts per 1,000 adults) has a negative and significant effect on

poverty in Nigeria. A one-unit increase in accounts per 1,000 adults is associated with a 0.0342 percentage point reduction in the poverty headcount ratio.

Table 2
Regression Results for Model 1 (Penetration)

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant	71.23	6.12	11.64	<0.001
ACC (Penetration)	-0.0342	0.0145	-2.36	0.033
FINCL	-0.0038	0.0019	-2.00	0.065
R-squared	0.58	Akaike Information Criterion (AIC)		98.34
Adj. R-squared	0.52	Schwarz Bayesian Criterion (BIC)		100.87
F-statistic	9.67	F-statistic (P-value)		0.02

Source: E-view 12 statistical software

The finding is consistent with Beck, Demirgüç-Kunt, and Levine (2007), who argued that expanding access to formal financial services enables poor households to smooth consumption, build assets, and invest in human capital. In Nigerian, increased digital account penetration brings previously unbanked individuals into the formal financial system through mobile money and agent banking. This integration facilitates the receipt of government cash transfers without the leakages typical of manual distribution systems (Aker & Mbiti, 2010). Furthermore, account penetration also reduces reliance on informal, predatory lenders who charge exorbitant interest rates, thereby improving household financial health (Banerjee & Duflo, 2011). However, the relatively small magnitude of the coefficient (−0.0342) suggests that penetration alone, without corresponding active usage, yields only modest poverty reduction. This aligns with the view of Diniz, Birochi, and Pozzebon (2012), who observed that account ownership without transaction activity does little to alter poverty dynamics. Therefore, while penetration is a necessary first step, it is not sufficient for transformative poverty reduction.

Model 2: Financial availability (BRANCH) and poverty

From table 3, the coefficient on BRANCH ($\gamma_1 = -2.891$, $p = 0.079$) is negative and statistically significant at the 10% level. This indicates that financial availability (measured by number of bank branches per 100,000 adults) has a negative and significant effect on poverty in Nigeria. A one-unit increase in branches per 100,000 adults is associated with a 2.891 percentage point reduction in the poverty headcount ratio.

Table 3
Regression Results for Model 2 (Availability)

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant	65.87	7.45	8.84	<0.001
BRANCH (Availability)	-2.891	1.523	-1.90	0.079
FINCL	-0.0041	0.0020	-2.05	0.060
R-squared	0.54	Akaike Information Criterion (AIC)	101.23	
Adj. R-squared	0.47	Schwarz Bayesian Criterion (BIC)	103.76	
F-statistic	8.23	F-statistic (P- value)	0.04	

Source: E-view 12 statistical software

The insignificance of digital financial availability on poverty strongly contradict the apriori expectation as it is expected that the availability of digital services such as agents, point-of-sale (POS) terminals, and automated teller machines (ATMs), would correlate with poverty reduction. However, several contextual factors explain this insignificance. First, low digital literacy renders agent unable to assist customers effectively second, touchpoints may be concentrated in urban areas, while poverty is predominantly rural (GSMA, 2020).

Model 3: Financial usage (MM) and poverty

The coefficient on MM ($\delta_1 = -2.145$, $p = 0.048$) is negative and statistically significant at the 5% level. This indicates that financial usage (measured by mobile money transaction volume as a percentage of GDP) has a negative and significant effect on poverty in Nigeria. A one percentage point increase in mobile money transaction volume (as % of GDP) is associated with a 2.145 percentage point reduction in the poverty headcount ratio.

Table 4
Regression Results for Model 3 (Usage)

Variable	Coefficient	Std. Error	t-Statistic	p-value
Constant	58.34	4.89	11.93	<0.001
MM (Usage)	-2.145	0.987	-2.17	0.048
FINCL	-0.0035	0.0016	-2.19	0.047
R-squared	0.61	Akaike Information Criterion (AIC)		97.45
Adj. R-squared	0.55	Schwarz Bayesian Criterion (BIC)		99.98
F-statistic	10.84	F-statistic (P-value)		0.01

Source: E-views 12 statistical software

This finding reflects the behavioural reality that poverty is reduced by what people actively do with digital financial services, not merely by what they have access to. The high R-squared value of 0.61 indicates that usage is the dominant explanatory variable among the three DFI dimensions, a finding consistent with the work of Koomson, Villano, and Hadley (2020), who reported that digital financial usage in Ghana had a larger poverty-reducing effect than mere account ownership. In Nigeria, the finding carries significant policy weight: interventions that encourage repeated, frequent digital transactions are likely to yield greater poverty dividends than those focused exclusively on expanding access points or opening dormant accounts.

Overall, financial literacy plays a mediating role in the relationship between digital financial inclusion and poverty reduction. The mediation analysis (test statistic = 1.98, $p = 0.048$) confirms that part of the effect of DFI on poverty operates through improvements in financial literacy. This finding aligns with Lusardi and Mitchell (2014), who established that financially

literate individuals are better equipped to make informed saving, borrowing, and payment decisions. In the context of digital finance, literate individuals use digital services more effectively in comparing transaction costs, avoiding fraudulent schemes, integrating digital payments into household budgeting, and leveraging digital credit products productively (Klapper, Lusardi, & Van Oudheusden, 2015).

Conclusion and recommendation

The study concludes that while all three dimensions of financial inclusion contribute to poverty reduction in Nigeria, active usage of digital financial services exerts the largest impact. However, digital financial inclusion alone is insufficient; its poverty-reducing potential is realised most when penetration translates into frequent, meaningful usage among financially literate populations. Based on the findings, the following recommendations were put forward: i. The CBN and mobile money operators should promote active usage of mobile money beyond person-to-person transfers and reduce transaction costs to encourage frequent usage.

ii. Bank management and fintech bosses should expand agent networks in rural and underserved areas to bridge the availability–usage gap.

iii. Policymakers should integrate financial literacy campaigns directly into digital financial service platforms.

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